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A MULTIPLE PIPET FOR THE COMPLEMENT-FIXATION TEST *

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Those familiar with the technic involved in the application of the complement-fixation test in the diagnosis of the various infectious diseases, are well aware that much time is consumed in the process of measuring and distributing the necessary substances, as normal sodium-chlorid solution, complement, sensitized rabbit serum, and suspension of blood corpuscles.

The type of pipet generally utilized in the process consists of glass tubes of uniform diameter, graduated into tenths or hundredths of a cubic centimeter, and with a capacity of 1, 5, 10, 20, or 25 cubic centimeters. Pipets of this type are usually filled by suction with the mouth controlled with the index finger. Constant practice enables one to be very accurate in the measurement of fluids and to acquire a moderate degree of speed in performing the work. When only a limited use of the complement-fixation test is necessary, pipets of this character are very satisfactorily employed. When on the other hand many samples of blood serum are to be diagnosed, a different method of distributing the fluids is necessary, otherwise numerous operators are required.

The need of a more rapid manner of accurately performing this work was recognized by the pathological division of the Bureau of Animal Industry, after the adoption of the complement-fixation test for diagnosing dourine, since it not infrequently happens that as many as 1,000 samples of blood serum are tested daily.

After experimenting with various devices in an endeavor to simplify the process, a multiple pipet was designed as shown in the accompanying illustrations. It not only permits of indefinitely greater progress, with greater accuracy, but at the same time eliminates the severe eye strain resulting from constant reading of the more generally used type of pipet.

This apparatus (Fig. 1) consists of a horizontal glass tube 12 in. in length which communicates below with 12 vertical pieces of tubing equally spaced and about 4 in. in length. These tubes, which are of uniform caliber, are slightly contracted at their free ends. A single

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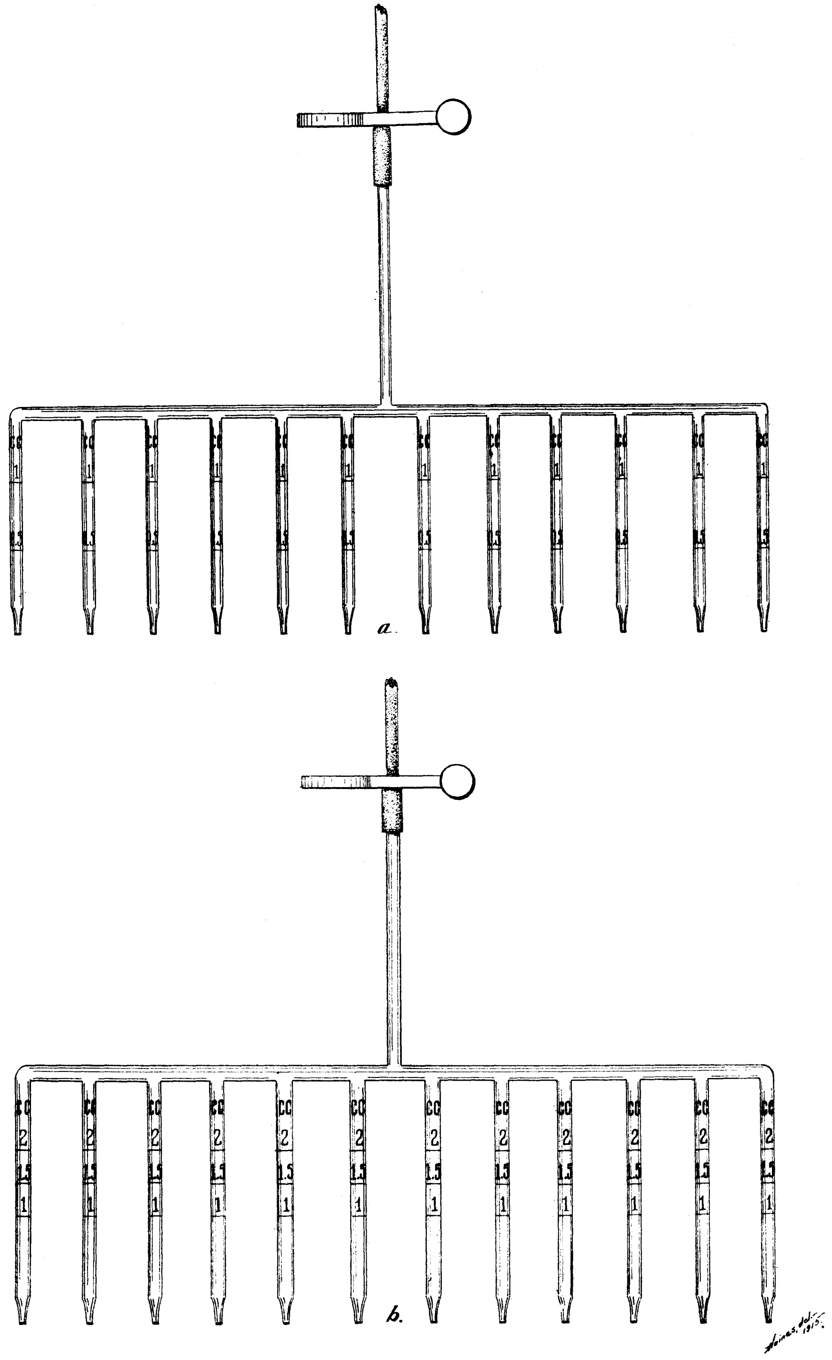

Fig. 1. Multiple pipet. (a) Utilized for distributing 0.5 c.c. or 1 c.c. (b) Utilized for distributing 1.5 c.c. or 2 c.c.

vertical section of tubing communicates with the horizontal part above and at the center.

The caliber of each of the vertical tubes dropped from the horizontal is such that when the pipet is immersed in a fluid to a depth of about 2½ in., each tube contains 2 c.c. or 1 c.c., depending on which of 2 sizes of pipets is employed. The vertical tubes of the larger pipets are graduated at the points when the content is 2 c.c., 1.5 c.c., and 1 c.c., respectively; but when it is desired to distribute 1 c.c. or 0.5 c.c. of a

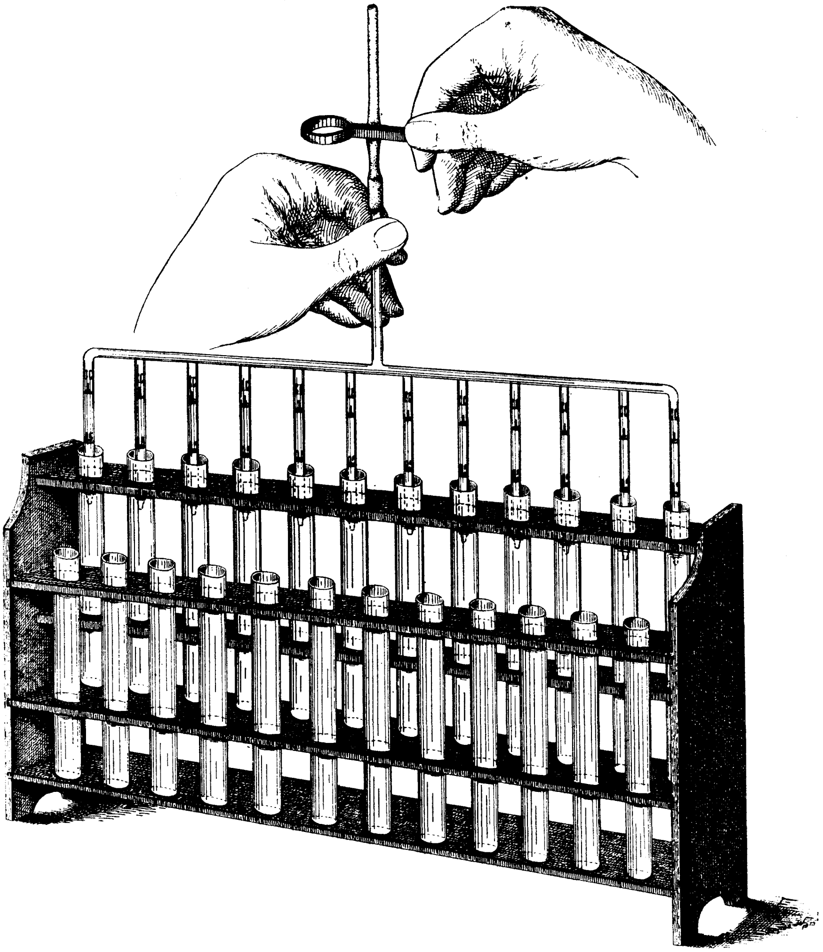

Fig. 2. The type of pipet used and the method of its operation.

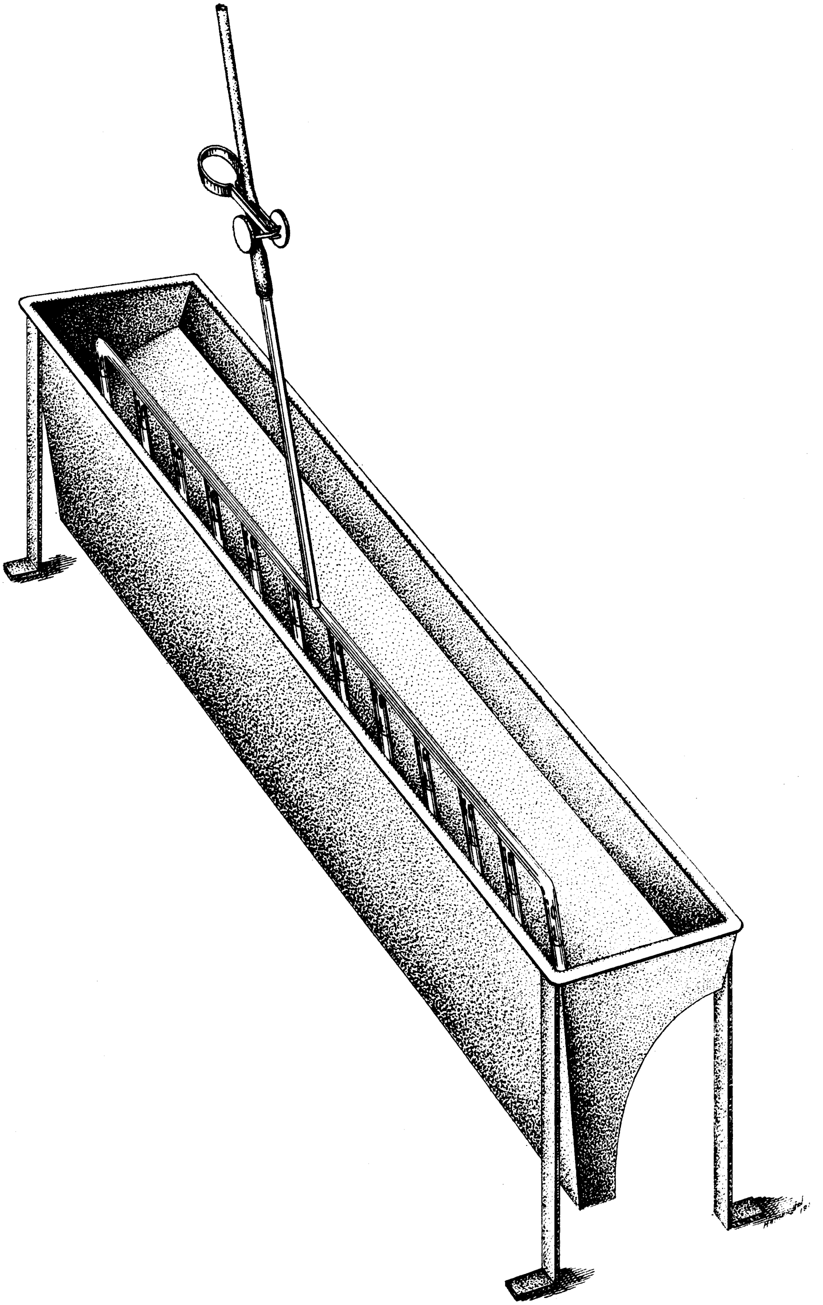

Fig. 3. Container for the substance to be distributed.

fluid, greater accuracy of measurement can be obtained through the use of the smaller caliber pipet, the diameter of the vertical tubes of which are such that when immersed in a fluid to a depth of about 2 in. the content of each is 1 c.c.

The pipet is controlled by means of a short piece of rubber tubing attached to the single vertical portion above the horizontal, to which a clamp is applied.

When operating, the clamp is released, the pipet immersed in the fluid to the 2-c.c., 1.5-c.c., or 1-c.c. graduation on the vertical tubes, and the clamp is then permitted to exert pressure on the rubber tube. The content of each vertical tube when the pipet is then removed from the fluid is 2 c.c., 1.5 c.c., or 1 c.c., depending on whether the rubber tube was clamped when the pipet was immersed to the 2-c.c., 1.5-c.c., or 1-c.c. graduation.

When pipets of this type are utilized, it is apparent that the test-tube racks should be constructed in such a manner that the spacing of the test tubes corresponds to the spacing of the vertical sections of the pipet; and it is advisable that the supporting bar for the upper portions of the tubes be placed not farther than 1 in. from the open end; otherwise some difficulty may be experienced in introducing the 12 vertical tubes of the pipet into the 12 test tubes for the delivery of the fluid. Figure 2 illustrates the design of rack employed. The 24 test tubes are so securely held that it is not necessary to remove and shake them separately when the various substances are added, but the rack may be shaken as a whole without danger of any of the test tubes being dislodged.

The receptacle used as container for the fluid that is to be distributed is illustrated in Figure 3. It is constructed with a narrow lower portion in order that suction with the mouth need be resorted to only in the distribution of the last 150 c.c. of the fluid, when its depth is not sufficient to fill the vertical sections of the pipet to the necessary level.

No great amount of practice is necessary in the manipulation of the apparatus to accomplish the ready and accurate distribution of 1 or 2 c.c. of a fluid to 1,000 test tubes in from 10 to 15 minutes.

Pipets of the content and graduation described are designed for use when the technic employed in applying the complement-fixation test is similar to the original Wassermann method, where the total quantity of the substances employed in combination with normal sodium-chlorid solution in each test tube is 5 c.c.